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U.S. Mixed-Oxide Fuel Facility Technology Regulatory Engagement Plan

ABSTRACT:

This plan provides information about newcleo Group and its U.S. subsidiary, newcleo Americas, efforts to establish a licensing project plan and associated preapplication engagements for its mixed oxide fuel facility (MFF) and fuel fabrication technology. This regulatory engagement plan is part of its strategy to prepare the necessary qualifying applications for a prospective U.S. MFF deployment and associated licensing activity.

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ACRONYMS AND ABBREVIATIONS

ASNR	French Nuclear Safety and Radiation Protection Authority
CFR	Code of Federal Regulation
DOS	French safety options file
ENEA	Italian National Agency for New Technologies, Energy and Sustainable Economic Development
IROFS	Items of relied on for safety
ISA	Integrated Safety Analysis
FOAK	First-of-a-kind
LFR	Lead-cooled Fast Reactor
LWR	Light Water Reactors
MFF	Mixed-Oxide Fuel Facility
MOX	Mixed-Oxide Fuel
NRC	U.S. Nuclear Regulatory Commission
REP	Regulatory Engagement Plan

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1 INTRODUCTION

This Regulatory Engagement Plan (REP) sets out newcleo's structured pre-application engagement strategy with the U.S. Nuclear Regulatory Commission (NRC) for a mixed-oxide fuel facility (MFF) project in the United States. The objective of the MFF project is to commercialize mixed-oxide fuel (MOX) fabrication technology to produce fuel assemblies for newcleo's LFR-AS-200 advanced nuclear reactor, a 480 MWth (200 MWe) lead-cooled fast reactor (LFR) technology designed for both electrical generation and industrial co-generation applications. MFF-produced fuel may also be used in other advanced reactor technologies and certain light water reactors (LWR) . The newcleo Group (collectively newcleo in this plan) is comprised of several business units with its newest subsidiary, newcleo Americas, established in late 2025 for the purpose of commercializing its MFF and LFR technology in the North American market and supporting the deployment of various projects utilizing those technologies.

newcleo initiated its U.S. regulatory engagement for the MFF technology with a pre-application meeting with NRC staff on March 5, 2026. The company presented its MFF design, MOX fabrication technology, safety aspects, preliminary licensing basis, and deployment ambitions. This REP is the direct follow-up to that meeting, translating the initial dialogue into a structured plan for pre-application engagement. This plan lays out the necessary licensing actions for an initial U.S. deployment project.

We acknowledge that the NRC activities associated with this REP are subject to the hourly rate for professional services in accordance with §170.31 and have established the necessary billing accounts with the NRC.

The REP describes: newcleo as a company and technology developer (Section 2); the MFF and MOX technology and its planned U.S. deployment path (Section 3); newcleo's planned licensing approach (Section 4); and the specific regulatory engagements planned between now and a future licensing action application filing (Section 5 and Appendix A).

newcleo brings to this engagement a substantial foundation of prior regulatory work: more than 10 meeting-days of pre-licensing engagement with the French nuclear safety radiation protection authority (ASNR) between 2023 and 2025, and over 200 pages of submitted safety documentation for pre-licensing review. The U.S. engagement builds directly on this body of work.

In December 2024, newcleo submitted its MFF safety options dossier (DOS) to the ASNR. As of July 2026, the ASNR has provided a positive opinion on this dossier. Following its review, the ASNR said: "*The ASNR considers that the safety demonstration provisions adopted by newcleo at the safety options stage are satisfactory and generally meet the objectives set by the decree of 7 February 2012*[1]*, particularly regarding the application of the defence-in-depth principle, the application of a prudent deterministic approach, the setting of sufficiently ambitious general safety objectives and the consideration of lessons learned from similar facilities*".

[1] The French decree of 7 February 2012 sets the general rules for the design, construction, operation, shutdown, decommissioning, maintenance, and monitoring of nuclear facilities in order to protect the interests covered by the French Environmental Code.

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The goal of this REP is to enable efficient resource planning for both NRC and newcleo and facilitate effective and efficient licensing activities.

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2 COMPANY INFORMATION

Since launching in 2021, newcleo has quickly established itself as innovator in the field of nuclear energy. newcleo is working to design, build, and operate Gen-IV Advanced Modular Reactors (AMRs) for multiple market applications along with the fuel technology supporting them. Our technologies are centered around liquid lead as the reactor coolant, fast spectrum neutrons, and mixed oxide fuel that can help nations address surplus defense-application plutonium and ultimately close the fuel cycle through safely reprocessing used nuclear fuels.

With over $780M in private funding, strong revenue streams, and over 100 partnerships and collaborations across the nuclear industry, the growth of the newcleo Group is supported through the targeted acquisition of key companies with strong capabilities in nuclear engineering, manufacturing, and waste management. Through its workforce of over 900 highly qualified employees across France, the U.S., the UK, Italy, Switzerland and Slovakia, newcleo is not only developing and delivering the skills and services required for the group's own ambitious project timelines but also supporting the development of Small Modular Reactor supply chains in Europe and beyond. Since 2025 the company has initiated a growing set of activities to bring these technologies to the U.S. market.

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3 NEWCLEO'S FUEL TECHNOLOGY

Key aspects of newcleo's corporate history, technology development program, research program, and reactor characteristics for the LFR-AS-200 are available in introductory meeting material available in ADAMS:

- https://www.nrc.gov/docs/ML2608/ML26082A018.pdf Company overview & technology development
- https://www.nrc.gov/docs/ML2608/ML26082A020.pdf LFR technology overview

Proprietary introductory material on the MFF project is also available in ADAMS under the newcleo project docket number 07-007051.

Lead-cooled fast reactors have been the subject of sustained international research and development since the 1990s, with programs conducted across Europe — including Belgium, France, Italy, the Netherlands, Sweden, and the United Kingdom — as well as in Japan and the United States. This work built a deep scientific foundation: characterization of lead's thermophysical and chemical properties, thermal-hydraulic modelling, code validation, and the development and qualification of MOX fuel and core materials in European fast reactor programs such as Phénix, Superphénix, and the Prototype Fast Reactor (PFR).

Much of this research was conducted in Italy, where the national agency Energia Nucleare ed Energie Alternative (ENEA) has been a central actor in LFR development for over two decades. newcleo was founded by researchers and engineers who came directly out of this environment. The company maintains a deep and ongoing collaboration with ENEA, including co-development and joint operation of the qualification and testing infrastructure at the Brasimone Research Centre. newcleo does not simply reference this body of work — it inherits it, having acquired key intellectual property and embedded the institutional knowledge of these programs into its design team.

3.1 MOX TECHNOLOGY

The MFF project will deploy newcleo's commercial-scale MOX fuel fabrication facility design in the U.S. market. This MOX fuel facility plant will enable the production of mixed oxide (PuO_2 and depleted UO_2) pins and fuel assemblies for use in newcleo LFR technologies. MFF-produced fuel may also be used in other advanced reactors and certain LWR technologies.

newcleo intends to apply relevant lessons from Europe's extensive experience with commercial MOX fuel production to the design of the proposed U.S. MFF. This experience includes the use of reprocessed plutonium feedstock and provides relevant insights for process selection, equipment configuration, material handling, maintainability, and operator interaction.

newcleo also expects development and testing at its FASTER facility in France to provide additional opportunities to refine process-line design and human-factors features before their potential incorporation into the U.S. facility. Applying these lessons early in design development is intended to improve safety, operability, and efficiency and to support a more mature and readily reviewable licensing basis for the U.S. MFF.

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The LFR-AS-200 is a commercially focused LFR technology designed to use MOX fuel tested in various international campaigns. For the U.S. market, it is anticipated that the initial fuel will be produced from surplus plutonium processed into a usable reactor fuel form. The LFR-AS-200 is also capable of using MOX fuel derived from recycled used nuclear fuel through the processes currently in use in France and under consideration in the U.S. market by multiple commercial interests.

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4 U.S. DEPLOYMENT PLANS AND LICENSING APPROACH

This section provides context for the regulatory engagements described in Section 5, particularly with respect to the anticipated licensing approach for the proposed U.S. MOX Fuel Fabrication Facility (MFF). The MFF would fabricate mixed-oxide fuel for newcleo's lead-cooled fast reactor program. Licensing of the reactor is outside the scope of this REP and is addressed through a separate NRC regulatory engagement plan. Discussion of the reactor in this REP is therefore limited to the interfaces necessary to define the MFF mission, fuel product, design requirements, and licensing assumptions.

4.1 REGULATORY FRAMEWORK

newcleo intends to pursue NRC authorization of the MFF under 10 CFR Part 70, *Domestic Licensing of Special Nuclear Material*. The licensing basis will also address applicable requirements in 10 CFR Parts 20, 30, 40, 51, 71, 73, and 74, as appropriate to the facility, its activities, and the possession, processing, storage, and transfer of special nuclear material.

The MFF will be designed and evaluated consistently with the performance requirements and integrated safety analysis provisions of 10 CFR Part 70, Subpart H. The safety program will identify credible accident sequences; designate items relied on for safety to prevent or mitigate those sequences and establish management measures that provide reasonable assurance that the IROFS will remain available and reliable. The license application will include an ISA Summary and the other safety, safeguards, security, environmental, and programmatic information required by the applicable regulations. NUREG-1520 will provide the principal NRC review-guidance framework, supplemented by other applicable NRC regulatory guidance and project-specific approaches developed through pre-application engagement. Part 70 requires an ISA to identify accident sequences and designate IROFS, and NUREG-1520 is the NRC's standard review plan for fuel-cycle facility license applications.

The MFF design builds on established European experience with commercial MOX fuel production and the use of reprocessed plutonium feedstock. newcleo intends to use this experience, together with development and testing conducted through the FASTER program, to inform process selection, equipment and facility design, human-factors engineering, technology qualification, and the supporting safety analyses. Pre-application engagement will be used to establish how this experience and supporting information should be presented and credited in the U.S. licensing process.

newcleo is also evaluating the potential effect of ongoing revisions to the Part 70 regulatory framework and associated NRC guidance. The licensing strategy will be updated, as necessary, to reflect the regulations and guidance applicable at the time of application. Where existing guidance does not fully address the proposed facility, technology, or licensing approach, newcleo intends to propose project-specific methodologies and obtain NRC feedback before relying on them in the license application.

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4.2 PRE-APPLICATION ENGAGEMENT

newcleo intends to use the pre-application period to:

1. establish a common understanding of the proposed MFF, its processes, and its relationship to the broader reactor fuel program;
2. obtain NRC feedback on the anticipated licensing pathway, application structure, and review guidance;
3. resolve significant technical, regulatory, policy, and programmatic matters early enough to support design and application development;
4. introduce the MFF safety-design approach progressively as the design and ISA mature; and
5. establish expectations for the timing, content, and review of white papers, topical reports, technical reports, and other pre-application submittals.

The engagements described in this REP will focus on matters for which early NRC feedback can reduce regulatory uncertainty or prevent significant rework. Expected topics include the proposed ISA framework and design-maturity approach; the application of NUREG-1520 and related guidance; identification and treatment of IROFS and defense-in-depth controls; nuclear criticality safety; fire protection; chemical and radiological hazards; human factors; management measures; quality assurance; material control and accounting; physical protection; environmental review; and the integration of European operating experience and technical information into the U.S. licensing basis.

The schedule and sequence of engagements will be coordinated with design development so that NRC review is supported by sufficient information while feedback can still meaningfully influence the facility design and licensing basis. Project-specific questions and requested NRC feedback will be identified in the associated meeting materials and pre-application submittals.

4.3 PROJECT LICENSING APPROACH

newcleo is developing the MFF project-delivery model, site-selection basis, commercial arrangements, and detailed licensing schedule. The current planning basis is to apply for authorization to construct and operate a plutonium-processing and MOX fuel-fabrication facility under 10 CFR Part 70. Part 70 expressly provides for applications to possess and use special nuclear material in a plutonium-processing or fuel-fabrication plant.

The specific application sequence and the extent to which construction authorization and operating authorization may be addressed separately or through a coordinated licensing process remain under evaluation. *new*cleo intends to engage the NRC on the appropriate licensing sequence, the information needed to support authorization of construction, the treatment of design information that continues to mature during review, and the findings necessary before the receipt and processing of special nuclear material.

Development of the license application will proceed in parallel with facility and process design maturation, technology-development activities, site characterization, ISA development, and establishment of required safety, safeguards, security, quality-assurance, and environmental programs. Where appropriate, previously

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submitted and NRC-reviewed pre-licensing engagement materials will be incorporated by reference or used to support the application.

The MFF and the LFR are expected to be licensed through separate NRC processes. Nevertheless, certain interfaces will require coordination, including fuel specifications, production throughput, qualification requirements, packaging and transportation, storage, delivery schedules, and changes to the reactor fuel design that could affect MFF processes or safety analyses. *new*cleo will establish interface controls to ensure that relevant reactor-program requirements are translated into controlled MFF design and licensing inputs.

The detailed schedule for pre-application activities and application submission will be provided in Section 5, Appendix A, and future updates to this REP. The schedule will be refined as the project-delivery model, site, design maturity, licensing pathway, and NRC review expectations are further developed.

5 PLANNED REGULATORY ENGAGEMENTS

Appendix A describes the pre-application submissions newcleo plans to provide to NRC in the form of white papers to introduce draft chapter content and other engagements. This approach anticipates progressive submissions through the end of 2027 to aid in resource planning for both the NRC and *new*cleo. All dates are provided as target submission periods for further coordination with the NRC Project Manager(s) as needed. If additional topics are identified for inclusion in this plan, or if a topic is determined to no longer be necessary, a revision to Appendix A will be provided. These engagements are planned to be conducted under NRC Docket No. 70-7051.

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APPENDIX A: MFF PREAPPLICATION ENGAGEMENT PLAN

Engagement Topic and Type	Submission Period (Calendar Year)	Objective
White Paper: Regulatory Analysis	[[ ]]P	Alignment of recently issued Part 70 regulation, NUREG-1520, NUREG-1718, and other key guidance.
Topical Report: U.S. MFF Quality Assurance Program Description	[[ ]]P	Approval of the approach to implement U.S. quality assurance standards for fuel cycle activities.
White Paper: Draft chapter: Nuclear Criticality Safety	[[ ]]P	Draft content of subject chapter along with descriptions of relevant technical bases and supporting information.
White Paper: Draft chapter: Integrated Safety Analysis	[[ ]]P	Focus on methodologies used in ISA development, organization of application content, and sequence
White Paper: Draft chapter: Fire Safety	[[ ]]P	Draft content of subject chapter along with descriptions of relevant technical bases and supporting information.
White Paper: Draft chapter: Plant Systems	[[ ]]P	Draft content of subject chapter along with descriptions of relevant technical bases and supporting information.
White Paper: Draft chapter content: DI&C and Automation Implementation	[[ ]]P	Draft content of subject chapter along with descriptions of relevant technical bases and supporting information.
White Paper: Draft chapter content: Security	[[ ]]P	Draft content of subject chapter along with descriptions of relevant technical bases and supporting information. Will be coordinated with establishing application information protection programs.
White Paper: Draft chapter content: MC&A	[[ ]]P	Draft content of subject chapter along with descriptions of relevant technical bases and supporting information. Will be coordinated with establishing application information protection programs.
White Paper: Draft chapter: Management Measures	[[ ]]P	Draft content of subject chapter along with descriptions of relevant technical bases and supporting information.
Meeting: Engagement: DI&C and Automation Implementation	[[ ]]P	Overview of newcleo implementation of automation principles and integrations of DI&C systems.
Meeting: Engagement: Human Factors Engineering	[[ ]]P	Overview of newcleo implementation of human factors engineering concepts into the facility design.
Meeting: Engagement: Emergency Management	[[ ]]P	Overview of general approach to emergency management and scope of emergency planning content supporting the future license application.

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